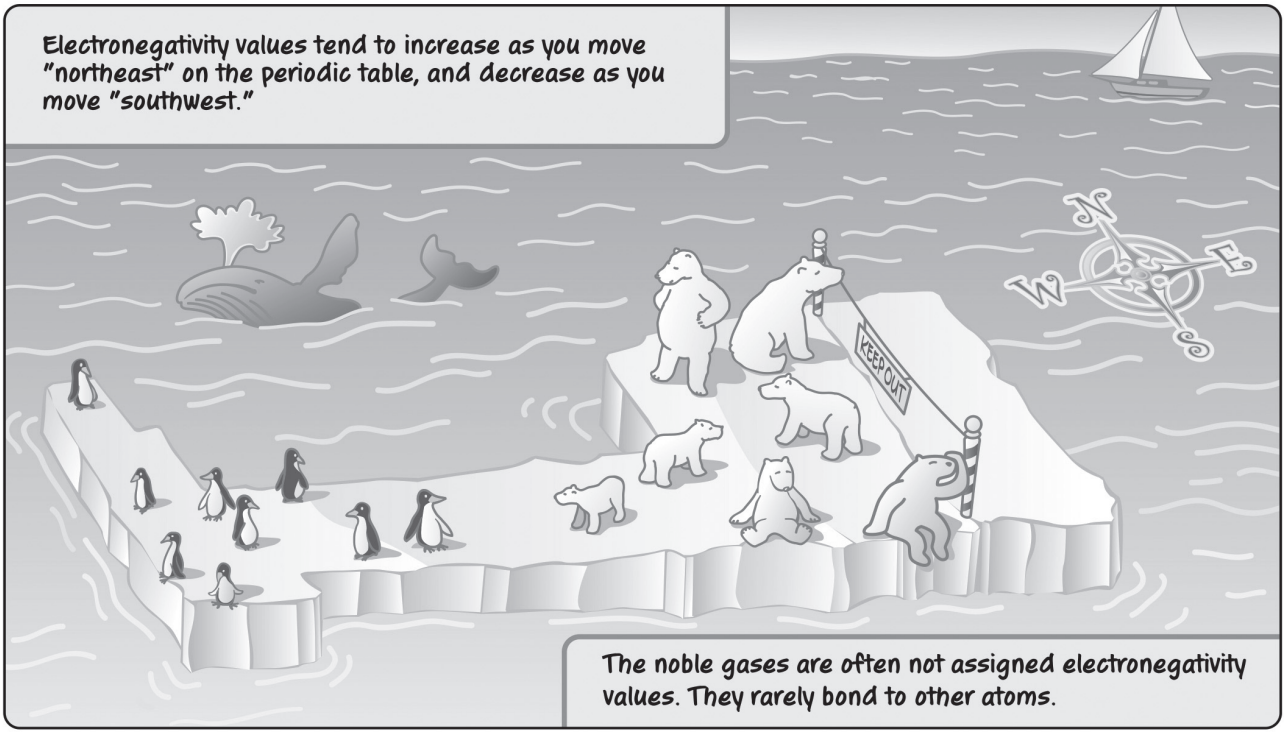
The BARE ESSENTIALS of POLARITY

You don't have to go to the ends of the earth to find polar molecules. They're all over the place. A polar molecule is just a molecule with a difference in electrical charge between two ends.

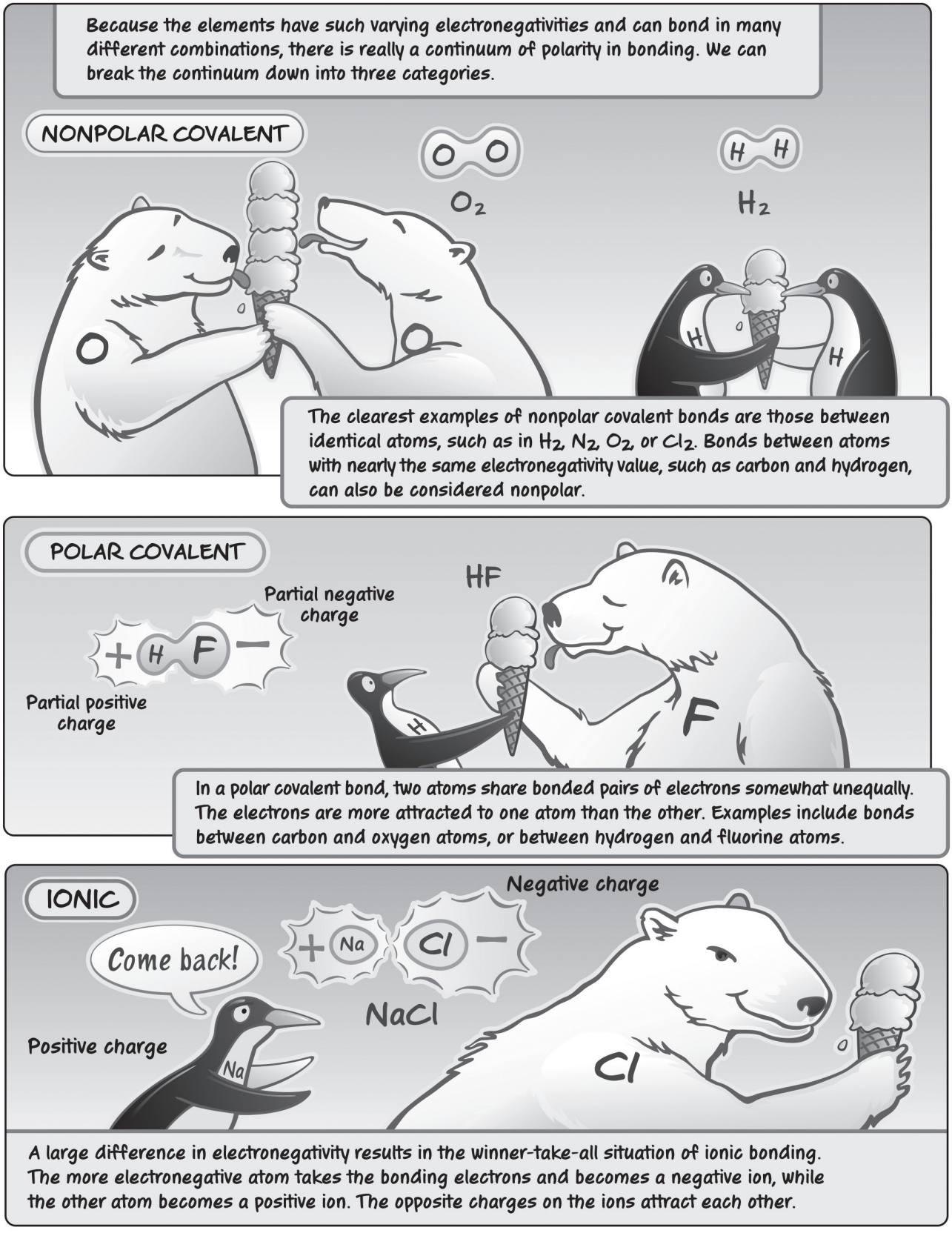
Polarity in molecules is caused by differences in electronegativity between atoms. Electronegativity describes the ability of an atom to attract bonding electrons toward itself.

Chlorine is more electronegative than hydrogen. So the bonded pair of electrons in HCl spends more time near chlorine.

Electronegativity values tend to increase as you move "northeast" on the periodic table, and decrease as you move "southwest."



The noble gases are often not assigned electronegativity values. They rarely bond to other atoms.

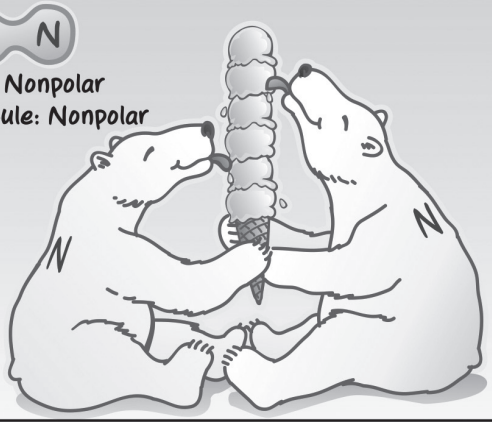


Polar bonds between atoms create dipoles. The word dipole can refer to (1) the polarity of an individual polar bond between atoms, (2) the net polarity of an individual polar molecule that may have several polar covalent bonds within it, and (3) the polar molecule itself.

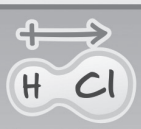
Confusing? Here are some examples:

An N_2 molecule isn't a dipole and it doesn't have any dipoles.

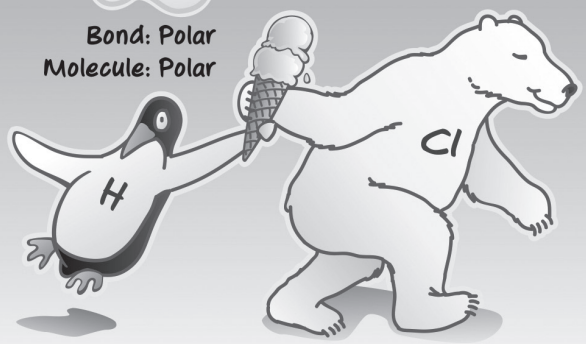
Bond: Nonpolar
Molecule: Nonpolar



HCl has a dipole and it is a dipole.



Bond: Polar
Molecule: Polar

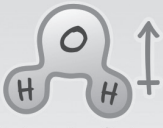


CO_2 has two dipoles but the CO_2 molecule itself is not a dipole. Its polar bonds balance each other out and make the molecule nonpolar overall.

Bonds: Polar
Molecule: Nonpolar

H_2O has two dipoles. Because of its bent shape, it also has a dipole in the sense of an overall polarity.

Bonds: Polar



Molecule: Polar

The polarity of molecules can affect many of their other properties, such as their solubility, their boiling and melting points, and their odor.